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| APPLICATION NO.  | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO.          | CONFIRMATION NO.       |
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| 10/763,059   | 01/22/2004  | Yoshihiko Kuroki     | S1459,700/77US00             | 3714                   |
| 7590 05/13/2008  |             |                      |                              |                        |
| Randy J. Pritzker<br>Wolf, Greenfield & Sacks, P.C.<br>600 Atlantic Avenue<br>Boston, MA 02210 |             |                      | EXAMINER<br>CHEN, CHIA WEI A |                        |
|  |             |                      | ART UNIT<br>2622             | PAPER NUMBER           |
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

# Office Action Summary

## Application No.

10/763,059

## Applicant(s)

KUROKI ET AL.

## Examiner

CHIA-WEI A. CHEN

## Art Unit

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**Period for Reply** -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 13 February 2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-37 is/are pending in the application.
- 4a) Of the above claim(s) 11-20, 22-36 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-10, 21 and 37 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 22 January 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB08)
- 4) ☐ Interview Summary (PTO-413)
- 5) ☐ Paper No(s)/Mail Date \_\_\_\_\_
- 6) ☐ Other: \_\_\_\_\_

**DETAILED ACTION**

***Claim Rejections - 35 USC § 102***

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1-5, 8, 10, and 37 are rejected under 35 U.S.C. 102(b) as being anticipated by MacAulay (US 6,483,641).

Claim 1, MacAulay teaches a three-dimensional image pickup apparatus in Fig. 3, comprising:

- a plurality of light receiving elements for receiving and converting light into an electric signal (light detector 26 that comprises an array of individual detection pixels; col. 17, lines 46-50); and
- a plurality of light path selection elements for selecting an incoming angle of light to come to said light receiving elements (spatial light modulator, e.g. digital micromirror device 34);
- said light receiving elements and said light path selection elements being arranged such that a plurality of pixels formed from said light receiving elements and said light path selection elements are disposed both in a row direction and a column direction (detection array and SLM array are aligned with each other; col. 17, lines 55-58, Fig. 4;

- intensities of the light received by said light receiving elements and the incoming angles of light selected by said light path selection elements being recorded in a coordinated relationship for the individual pixels (Controller compiles data obtained from the detector to reconstruct images. This would require the recording of the coordinated relationships of the angles of the SLMs and the intensity of light received by the light detector; col. 16, lines 10-12).

Claim 2, MacAulay teaches a three-dimensional image pickup apparatus according to claim 1, wherein each of the pixels is formed from one of said light receiving elements and one of said light path selection elements which are paired with each other (col. 17, lines 55-58).

Claim 3, MacAulay teaches a three-dimensional image pickup apparatus according to claim 1, wherein the incoming angle of light selected by each of said light path selection elements varies as time passes (col. 22, lines 40-47).

Claim 4, MacAulay teaches a three-dimensional image pickup apparatus according to claim 1, wherein each of said light path selection elements is a reflecting element which drives a reflecting plate for reflecting light to select the incoming angle of light which comes to one of said light receiving elements so that the light of the incoming angle is light reflected by the reflecting plate (SLM may be a digital micromirror device that reflects light to the image plane 40; col. 16, lines 39-46).

Claim 5, MacAulay teaches a three-dimensional image pickup apparatus according to claim 4, wherein said reflecting element is a mirror plate, a Micro-Electro-Mechanical Systems element or a digital micromirror device (trade name) driven by a piezoelectric element (col. 16, lines 39-46).

Claim 8, MacAulay teaches a three-dimensional image pickup apparatus according to claim 1, wherein said light path selection elements are liquid crystal waveguides disposed in front of light receiving faces of said light receiving elements and selectively vary the refractive index of liquid crystal filled in said waveguides to select transmission paths of light (SLM can be an array of ferroelectric liquid crystal device; col. 15, line 27).

Claim 10, MacAulay teaches a three-dimensional image pickup apparatus, comprising:

- light intensity acquisition means for acquiring intensity information of received light (intensity of the light impinging on individual pixels in the detection array can be detected; col. 22, lines 44-45); and
- incoming angle acquisition means for acquiring incoming angle information of the received light (controller varies the orientation of the SLM and illuminates the object from a plurality of angles; col. 22, lines 40-45); the
- intensity information and the incoming angle information of the light being recorded in a coordinated relationship with each other (It is inherent that the intensity information and the incoming information be recorded in a coordinated relationship

with each other in order to be reconstructed as an 3-D image of the sample; col. 22, lines 45-50).

Claim 37 is analyzed as an information recording method of the apparatus of claim 10.

***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over MacAulay (US 6,483,641) in view of Moranski (US 6,094,289).

Claim 6, MacAulay teaches a three-dimensional image pickup apparatus according to claim 1, but does not teach wherein said light path selection elements are driving members which carry and drive said light receiving elements to vary the directions in which light receiving faces of said light receiving elements are directed.

Moranski teaches driving members which carry and drive said light receiving elements to vary the directions in which light receiving faces of said light receiving elements are directed (photodetector 216 disposed on a free end of a cantilever beam; col. 13, lines 14-23).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used the driving member of Moranski with the apparatus of MacAulay in order to avoid a movable structure that is susceptible to mechanical fatigue and failure. The cantilever beam is a solid state device which has extremely high reliability. (See col. 2, lines 1-15 of Moranski.)

5. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over MacAulay (US 6,483,641) in view of Sun (US 6,415,068).

Claim 7, MacAulay teaches a three-dimensional image pickup apparatus according to claim 1, but does not teach wherein said light path selection elements are lenses disposed in front of light receiving faces of said light receiving elements and drive said lenses to vary relative positions of said lenses to said light receiving elements.

Sun teaches wherein said light path selection elements are lenses disposed in front of light receiving faces of said light receiving elements and drive said lenses to vary relative positions of said lenses to said light receiving elements (col. 3, line 66-col. 4, line 7; col. 6, lines 10-16).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used the microlenses of Sun with the apparatus of MacAulay since the microlens switching assembly provides a fast switching of signals and a small required driving force.

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6. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over MacAulay (US 6,483,641) in view of Hosoi (US 6,400,490).

Claim 9, MacAulay teaches a three-dimensional image pickup apparatus according to claim 1, but does not teach wherein said light path selection elements are Mach-Zehnder elements disposed in front of light receiving faces of said light receiving elements and each selectively varies the refractive index of a phase control section provided in a light path to cause interference of light to select transmission paths of light.

Hosoi teaches wherein said light path selection elements are Mach-Zehnder elements (12).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used the Mach-Zehnder waveguides of Hosoi with the apparatus of MacAulay since the Mach-Zehnder optical modulator is stable with respect to disturbance and can obtain modulation characteristics featuring excellent signal-to-noise ratio. (See col. 1, lines 15-25 of Hosoi.)

7. Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Holzbach (US 6,795,241) in view of MacAulay (US 6,483,641).

Claim 21, Holzbach teaches a three-dimensional image pickup and display apparatus in Fig. 14, comprising:



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- a light reception section (detector element 172) including a plurality of light receiving elements for receiving and converting light into an electric signal and
- said light receiving elements and said first light path selection elements being arranged such that a plurality of pixels formed from said light receiving elements and said first light path selection elements are disposed both in a row direction and a column direction (col. 10, line 47),
- a light emission section (LED) including a plurality of light emitting elements for emitting light in accordance with an electric signal and a
- plurality of second light path selection elements (light modulator DMD) for selecting an outgoing angle of light to be emitted from said light emitting elements,
- said light emitting elements and said second light path selection elements being arranged such that a plurality of pixels formed from said light emitting elements and said second light path selection elements are disposed both in a row direction and a column direction (col. 9, lines 9-15),
- said light emitting elements emitting light in accordance with a coordinated relationship between the outgoing angles of light selected by said second light path selection elements and the intensities of light for the individual pixels based on the video signals (control both light intensity and light directions; col. 5, lines 13-17);

but does not expressly teach:

- a plurality of first light path selection elements for selecting an incoming angle of light to come to said light receiving elements,

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- intensities of the light received by said light receiving elements and the incoming angles of light selected by said first light path selection elements being coordinated with each other for the individual pixels to form video signals.

MacAulay teaches

- a plurality of first light path selection elements for selecting an incoming angle of light to come to said light receiving elements (spatial light modulator, e.g. digital micromirror device 34), and
- intensities of the light received by said light receiving elements and the incoming angles of light selected by said first light path selection elements being coordinated with each other for the individual pixels to form video signals (Controller compiles data obtained from the detector to reconstruct images. This would require the recording of the coordinated relationships of the angles of the SLMs and the intensity of light received by the light detector; col. 16, lines 10-12).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used the light path selection elements of MacAulay with the apparatus of Holzbach to provide a significant advantage in controlling the angle of illumination, quantity of light, and the location of light reaching the detector. (See col. 2, lines 54-64 of MacAulay.)

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to CHIA-WEI A. CHEN whose telephone number is

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(571)270-1707. The examiner can normally be reached on Monday - Friday, 7:30 - 17:00 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, NgocYen Vu can be reached on (571) 272-7320. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Chia-Wei A Chen/  
Examiner, Art Unit 2622  
05/08/2008

***/Ngoc-Yen T. VU/  
Supervisory Patent Examiner, Art Unit 2622***